

Collection5 MODIS Terrestrial GPP and NPP (MOD17)



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Improvements from Collection 4 to Collection 5

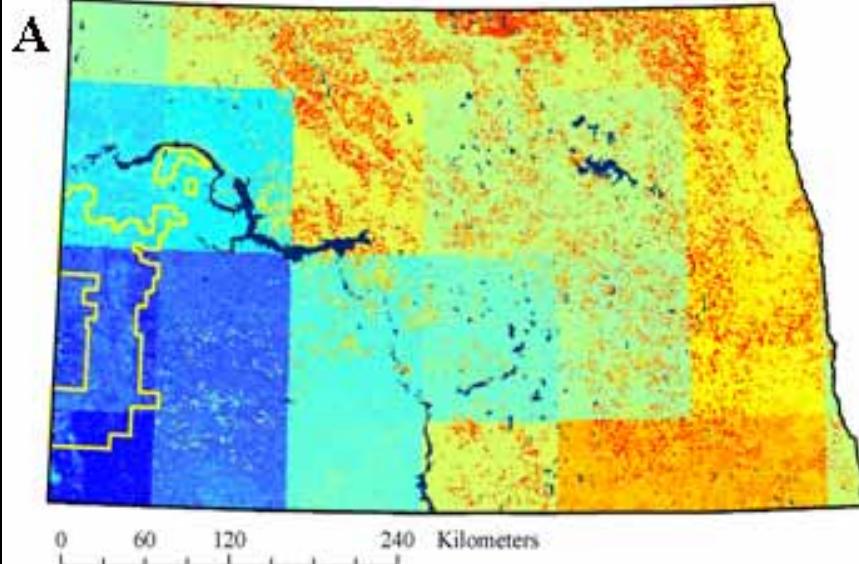
❖ Algorithm refinements

- $Q_{10} = 2.0 \longrightarrow Q_{10} = 3.22 - 0.046 * T_{avg}$
- $R_g = f(LAI_{max}) \longrightarrow R_g = 0.25 * NPP$
- Updated BPLUT

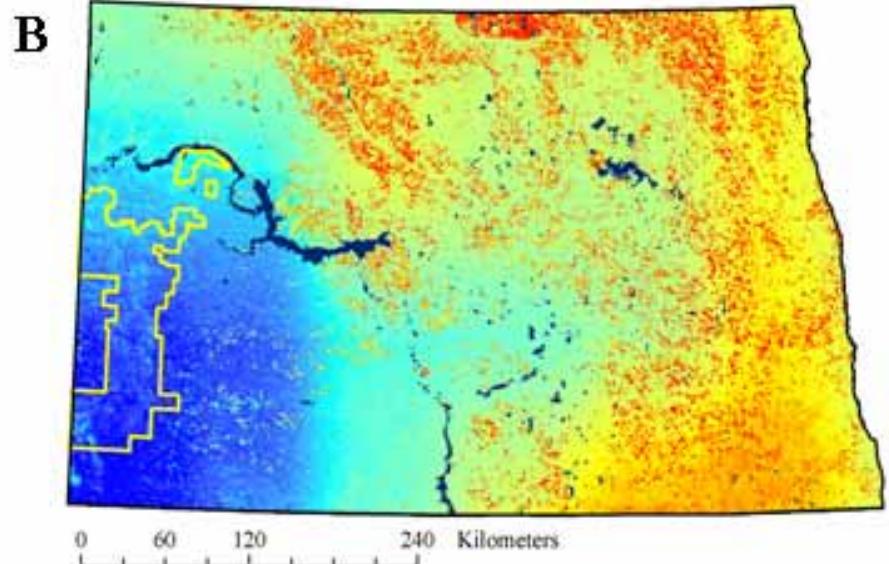
❖ Data input improvements

- Spatial interpolation of GMAO/NASA (meteorology data)
- Temporal filling of missing and cloud-contaminated MODIS FPAR/LAI (Collection 4)

Spatial Interpolation of GMAO

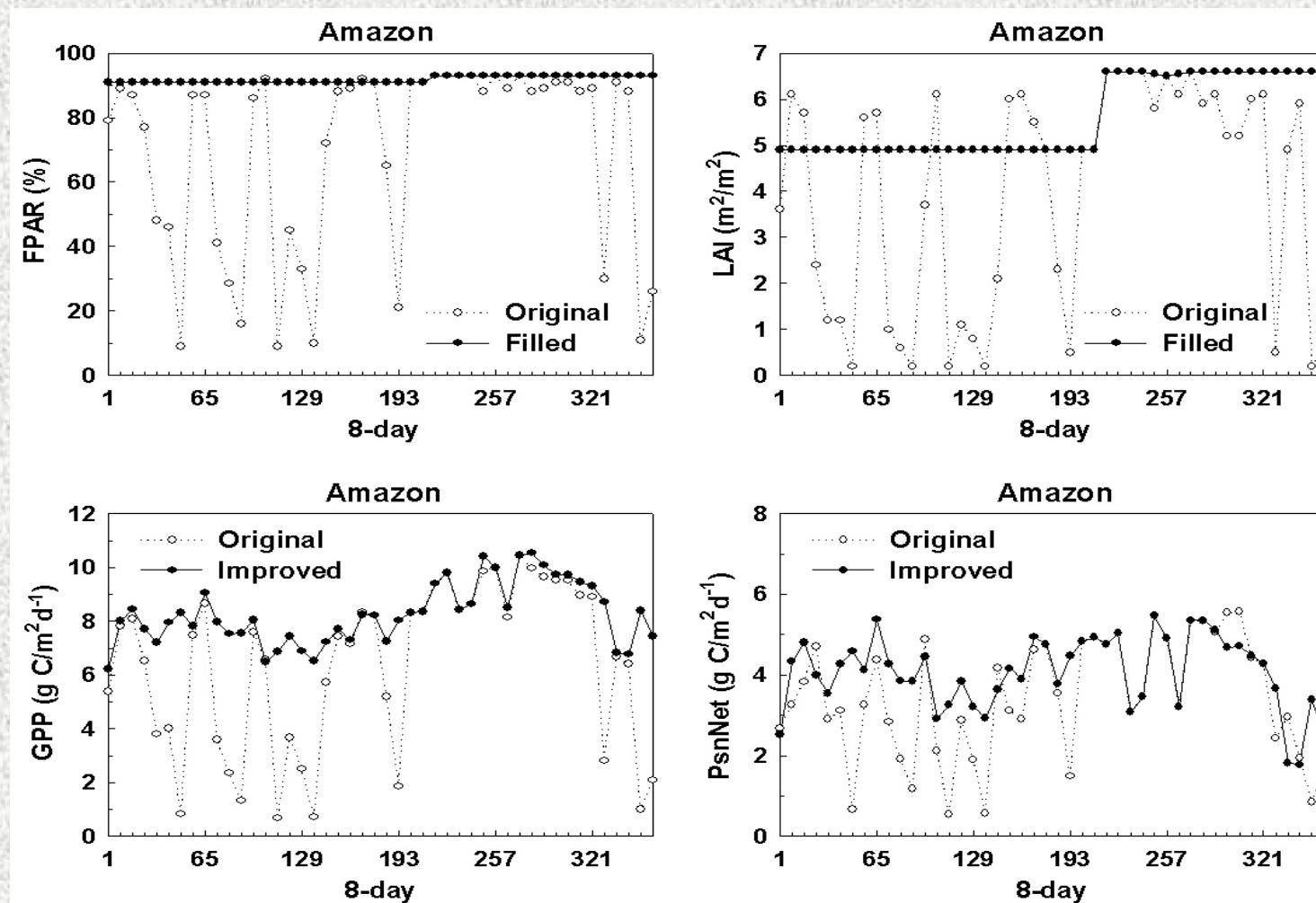


North Dakota
Little Missouri National Grasslands
PSNnet (Kg C m^{-2})
High : 0.0335
Low : -0.0152
Water



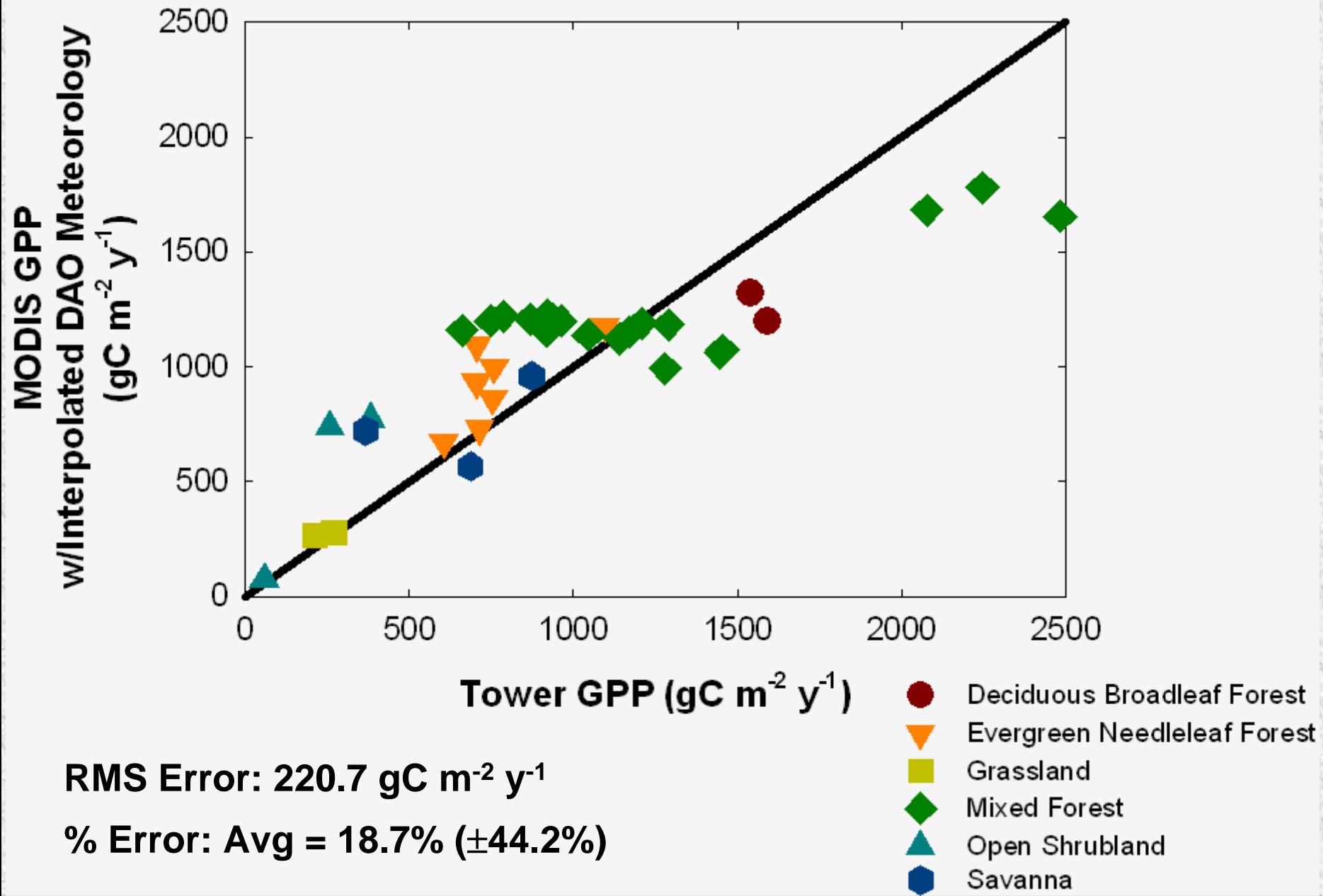
North Dakota
Little Missouri National Grasslands
PSNnet (Kg C m^{-2})
High : 0.0306
Low : -0.0164
Water

Temporal Filling of Unreliable FPAR/LAI (Amazon Rain Forest)

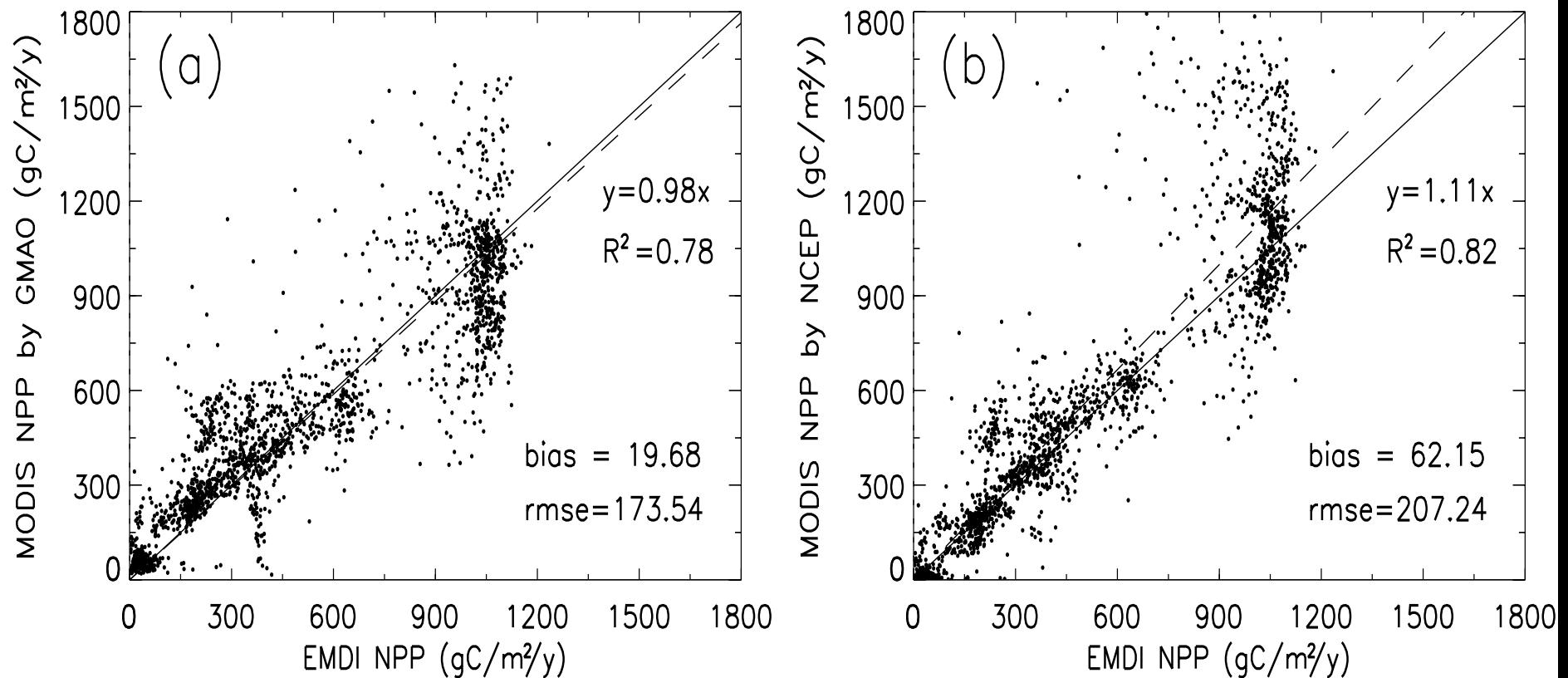


- Original GPP = $2252 \text{ g C/m}^2 \text{y}^{-1}$, NPP = $871 \text{ g C/m}^2 \text{y}^{-1}$
- Improved GPP = $2759 \text{ g C/m}^2 \text{y}^{-1}$, NPP = $914 \text{ g C/m}^2 \text{y}^{-1}$

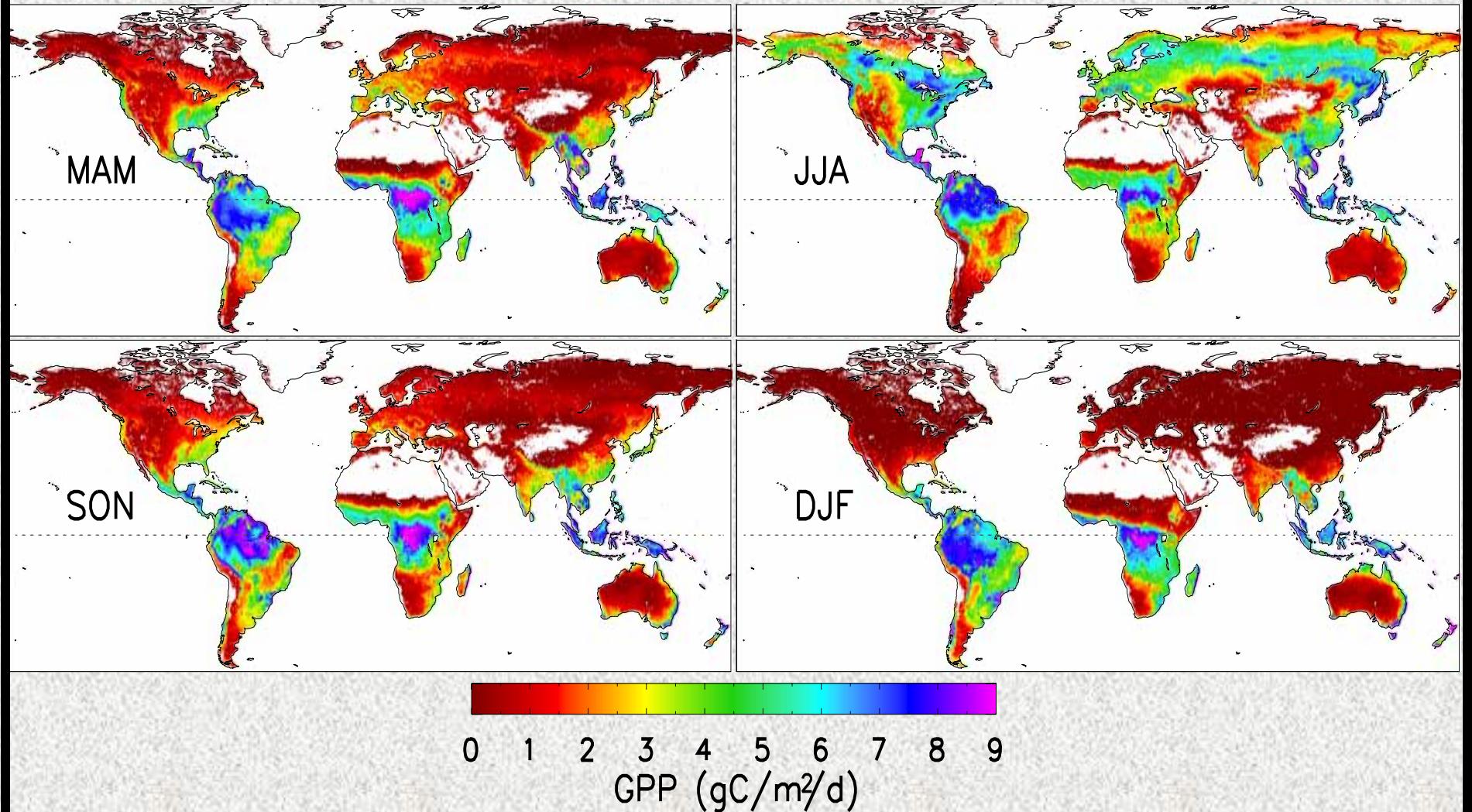
Validation of Annual GPP at AmeriFlux



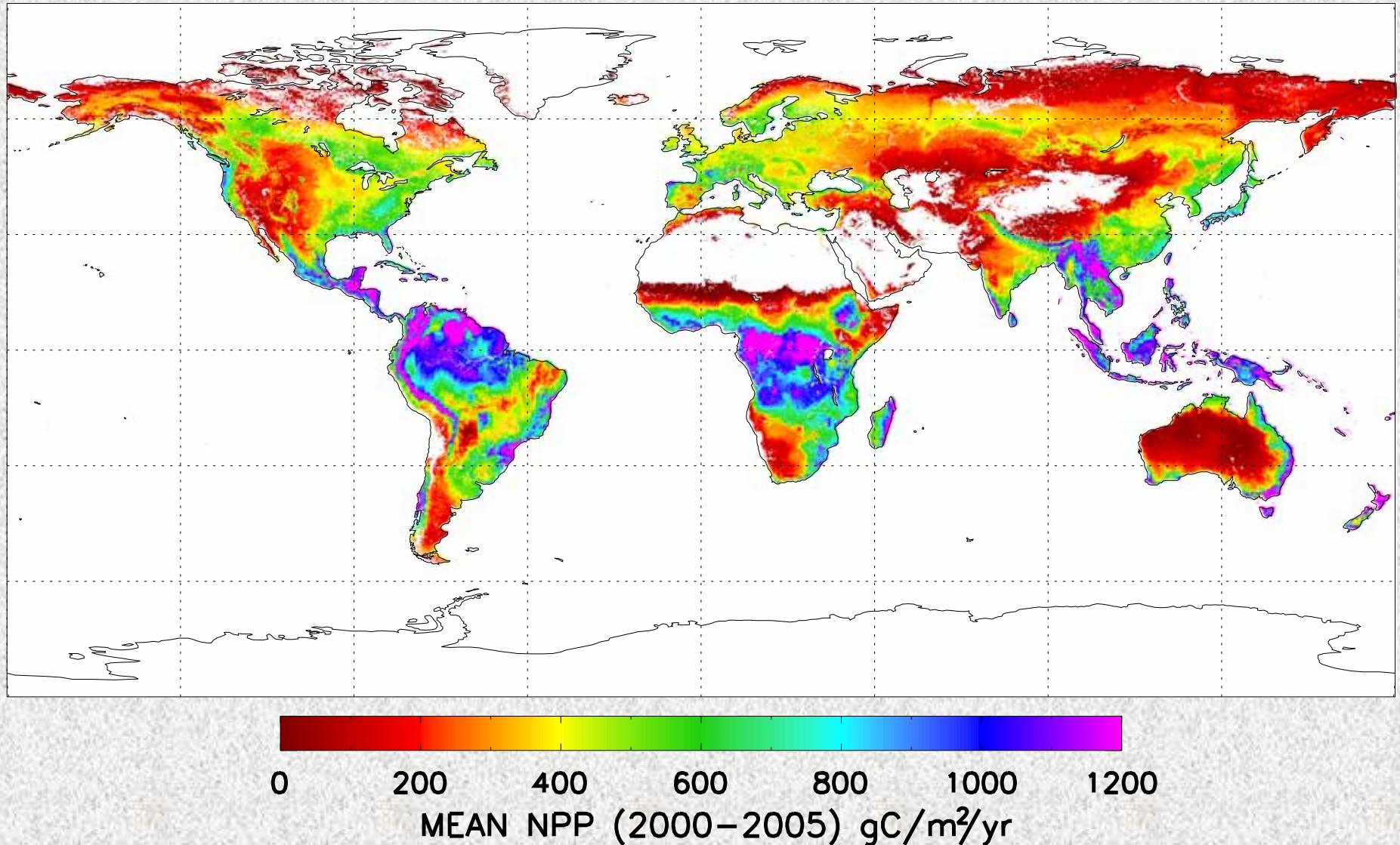
Validation of Annual NPP



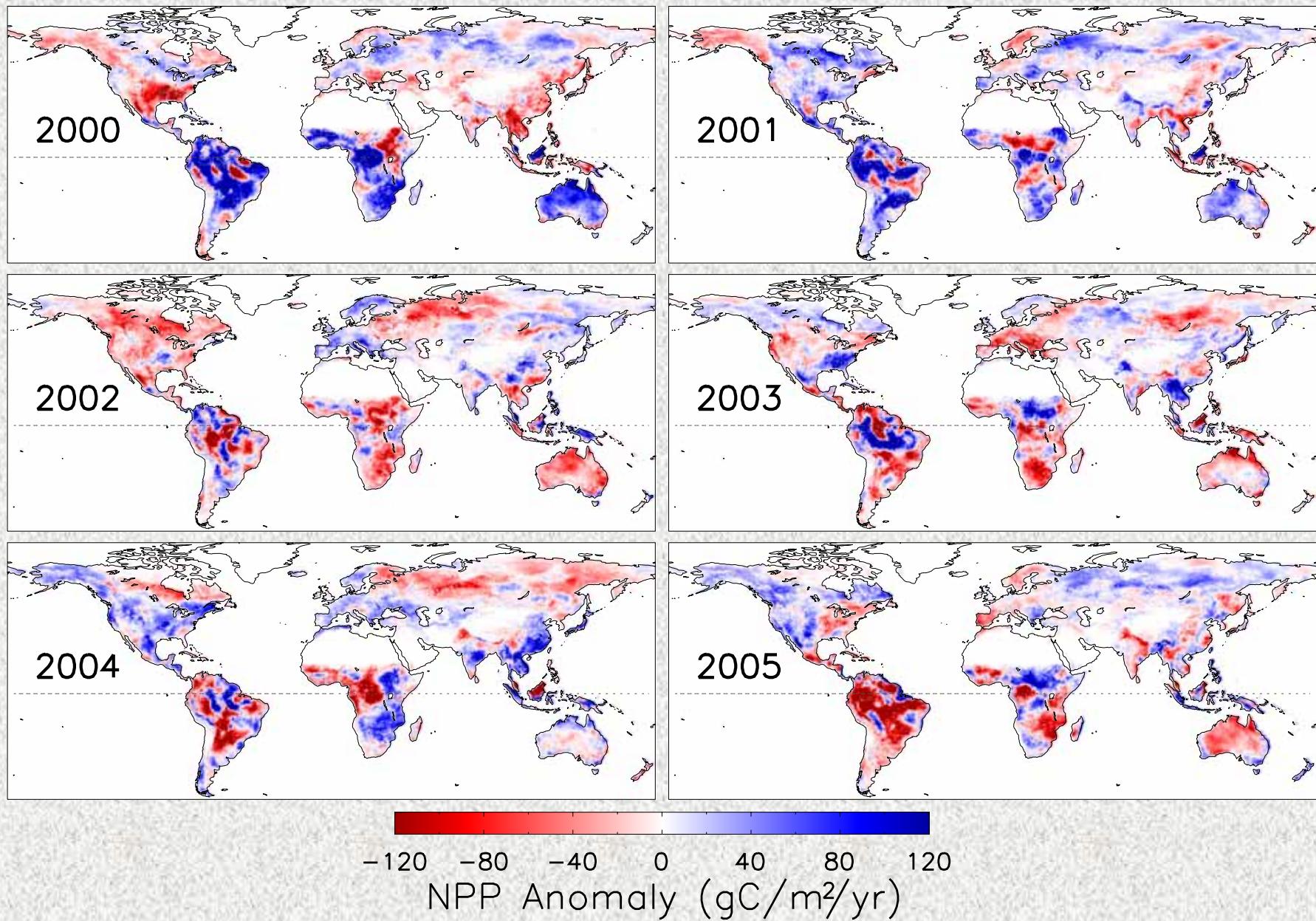
MODIS GPP Seasonality (Spatial)



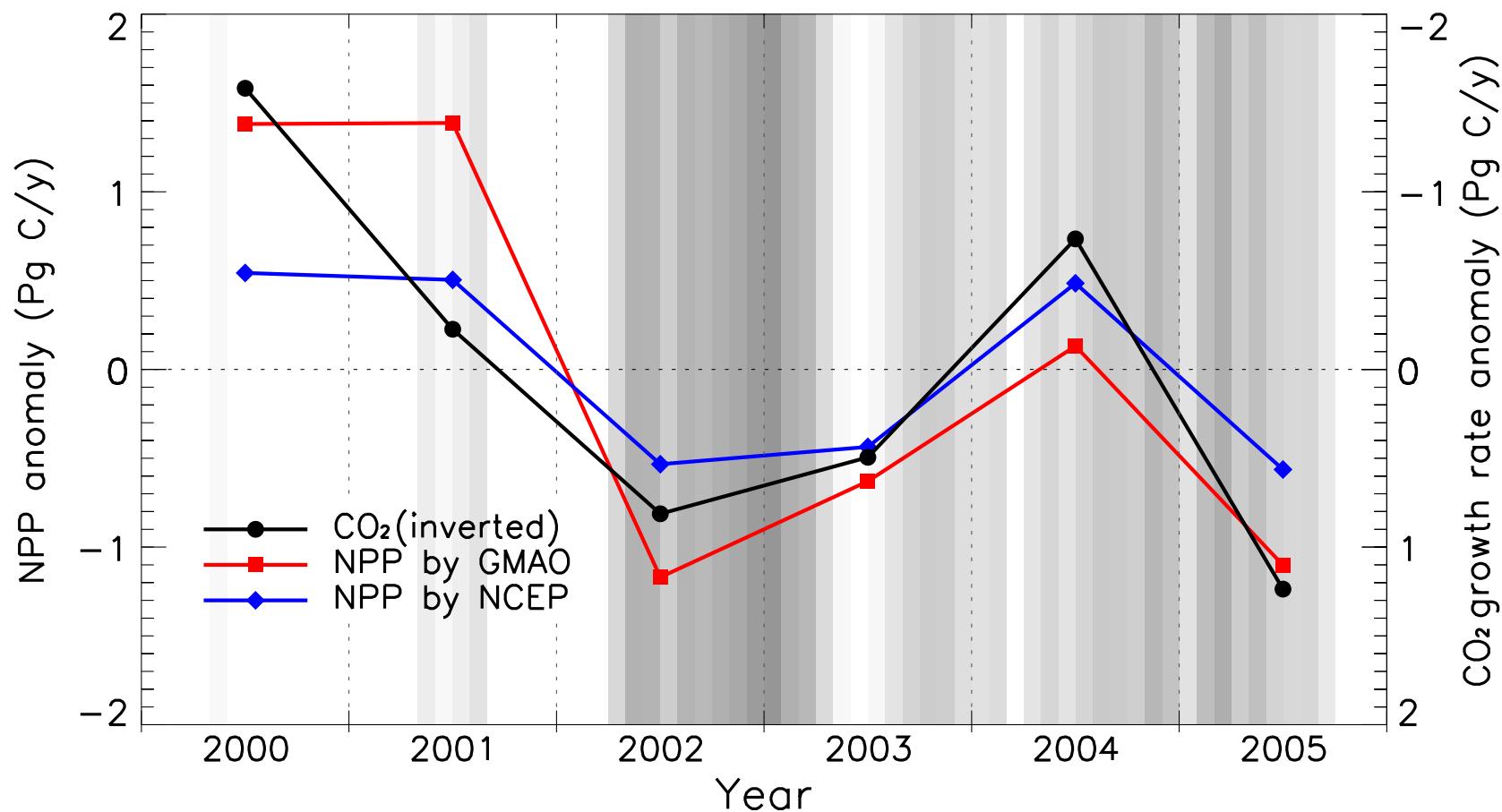
Mean Annual NPP (2000 ~ 2005)



Inter-annual Anomalies of MODIS NPP (Spatial)



Inter-annual Anomalies of MODIS Global NPP

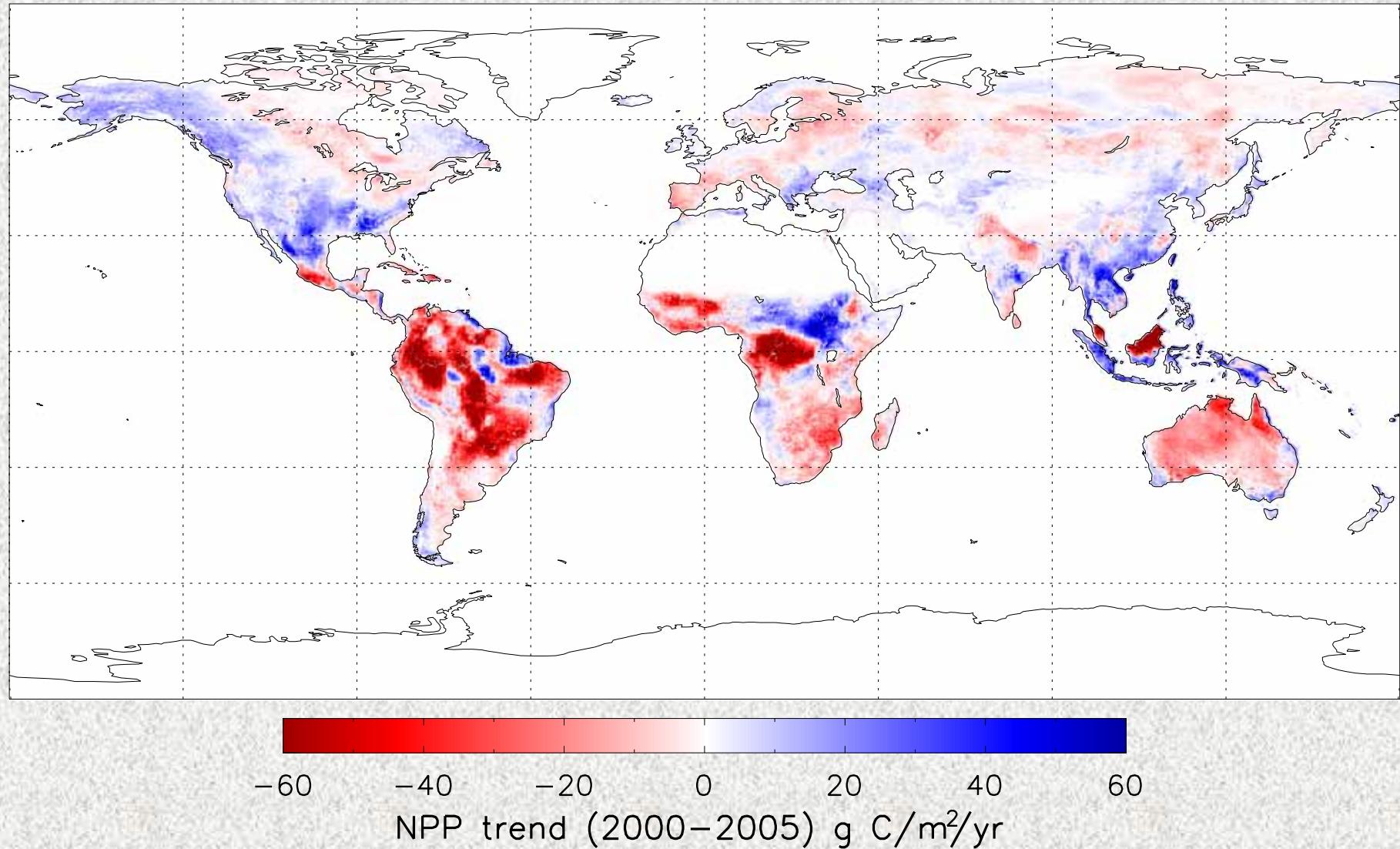


Correlation between NPP and inverted CO₂ growth rate

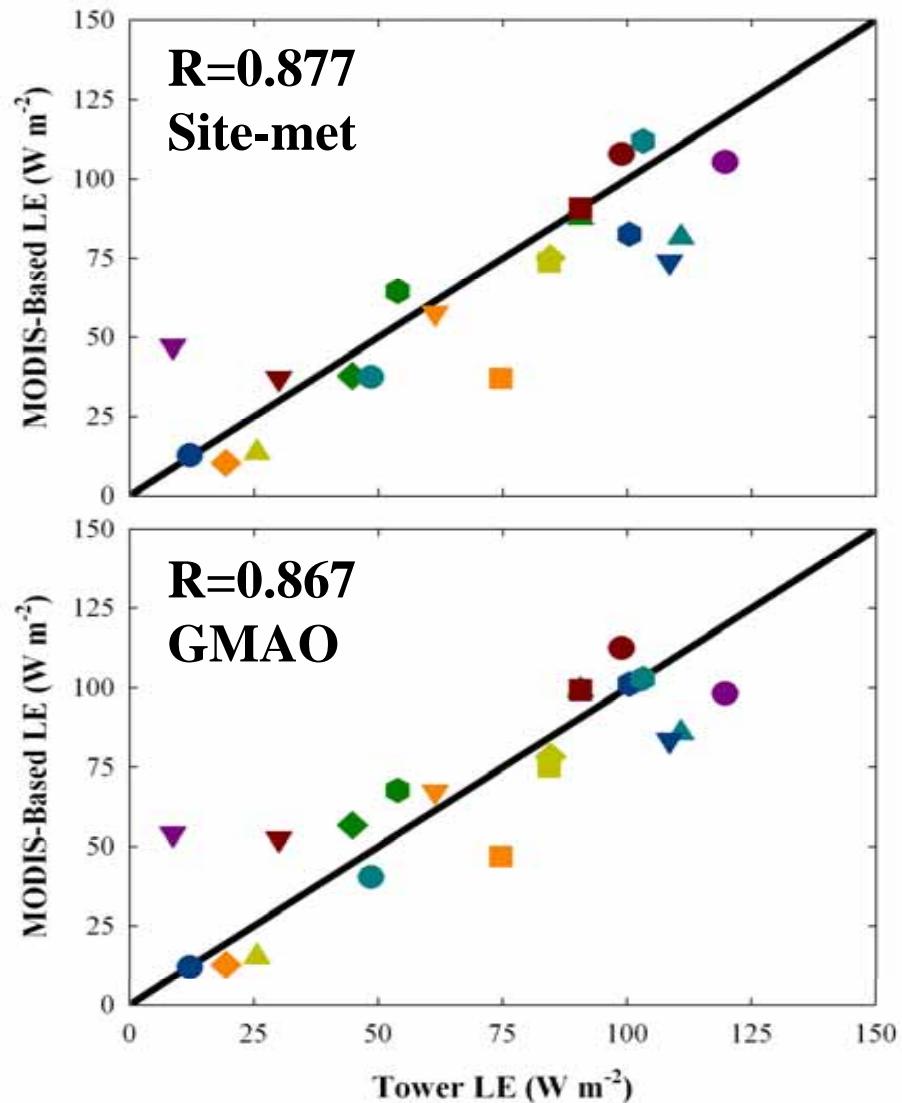
NPP by GMAO R = 0.85 2000~2005 p < 0.016

NPP by NCEP R = 0.91 2000~2005 p < 0.006

Linear Trend in the Global NPP (2000~2005)

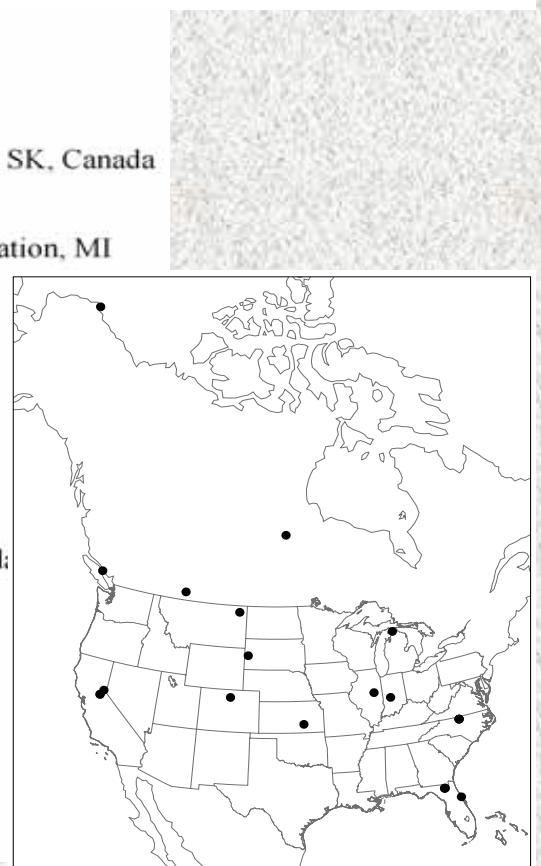


MODIS Evapotranspiration Validation at AmeriFlux



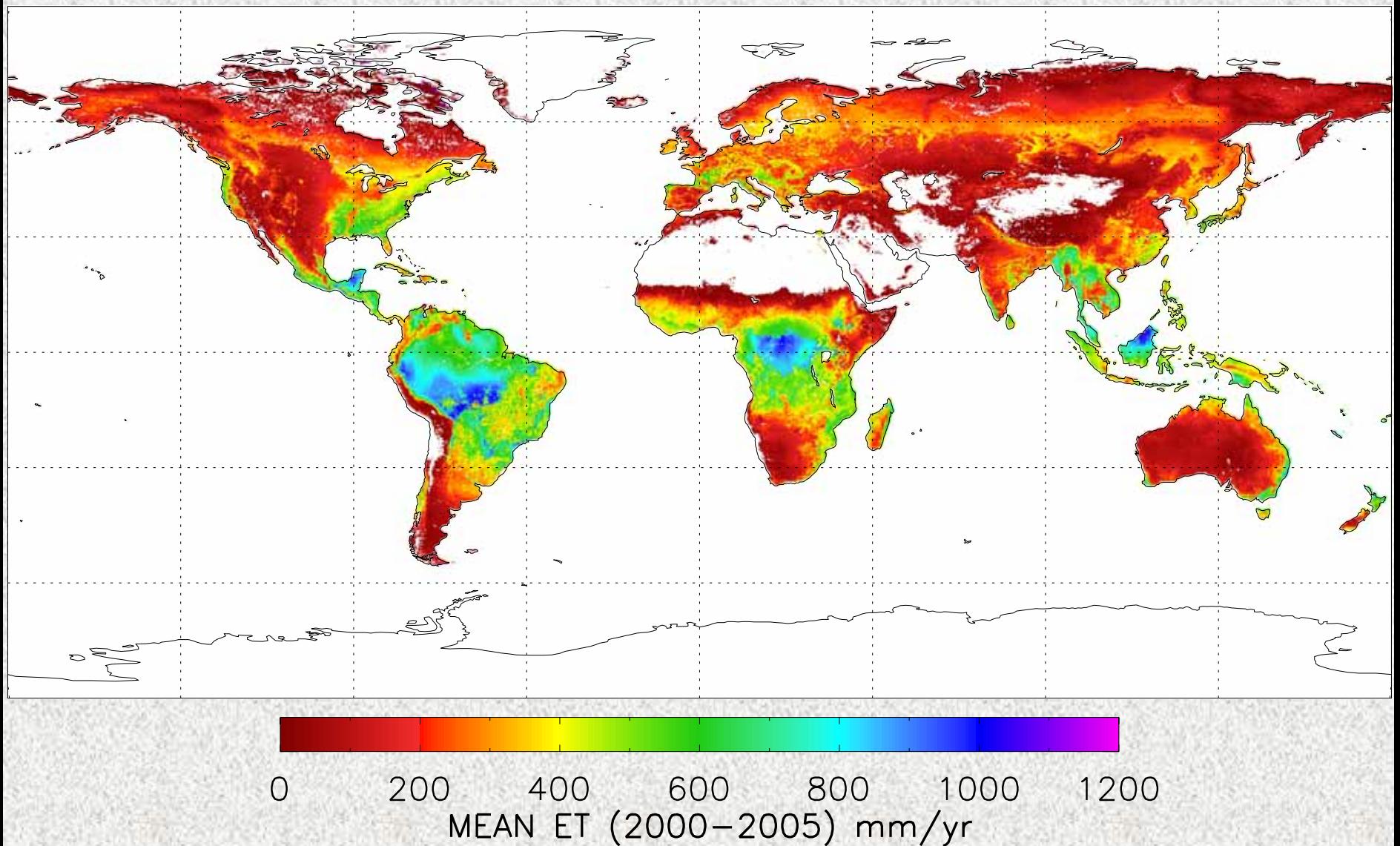
- Austin-Cary, FL
- ▼ Black Hills, SD
- Blodgett Forest, CA
- ◆ Campbell River, BC
- ▲ Donaldson, FL
- Duke, NC (Pine)
- Mize, FL
- ▼ Nrn Old Black Spruce, SK, Canada
- Niwot Ridge, CO
- ▲ U. Mich. Biological Station, MI
- ▲ Duke, NC (hardwood)
- Kennedy SFC, FL
- Barrow, AK
- ▼ Tonzi Ranch, CA
- Duke, NC (open)
- Fort Peck, MT
- ▲ Lethbridge, AB, Canada
- Vaira Ranch, CA
- Walnut Gulch, AZ
- ▼ Bondville, IL

RMSE: Site-met GMAO
Daily: 36.1W/m² 38.5W/m²
8-day: 26.5W/m² 28.8W/m²



(Mu et al. 2007, RSE, in revision)

MODIS Global Evapotranspiration (2000~2005)



(Mu et al. 2007, RSE, in revision)

Thanks!

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